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Lower Cretaceous beds, which are left out of the geologic column. A great break in the sedimentary sequence would still exist between the Wealden and Dakota. In the light of the testimony of structure and paleontology, the current hypothesis that land conditions prevailed in Jurassic time makes a much more harmonious and acceptable geologic record.

Personally, while differing with Prof. Marsh, the writer feels grateful that he has reopened this question, for we believe it will result in a more thorough understanding and appreciation of the Lower Cretaceous epoch and its influence in the making of our continental history. In conclusion, however, we must confess our inability to see that Prof. Marsh has submitted sufficient proof to maintain his proposition or to upset the accepted results of the minute geologic research throughout the Atlantic Coastal Plain. To prove these beds Jurassic by moving the boundary between periods is not an altogether satisfactory method, nor in harmony with geologic usage. Neither will the testimony of a few vertebrates in beds abounding in Cretaceous-like plants and invertebrates be of sufficient weight to upset the accepted nomenclature, especially when the time position of these vertebrates in the European standard to which they are referred is unknown.

Inasmuch as the evidence contrary to Prof. Marsh's position has all been brought out in accepted scientific literature, and he, as yet, has presented no detailed evidence to maintain his unique position, it is difficult to appreciate his statement that the burden of proof 'belongs upon those who hold contrary opinions' to himself. It appears instead that he is submitting data which may be used to advantage by those who might believe in the Cretaceous age of the beds which he has so long called Jurassic.

R. T. H.

PROFESSOR WILSON'S ADDRESS AT THE PRINCETON SESQUICENTENNIAL CELEBRATION.

THE concluding part of Professor Woodrow Wilson's oration at the Princeton sesquicentennial celebration has been received with general applause by literary and religious journals. The occasion of its delivery made it more than an individual utterance, for the speaker and the

hearers must have understood it to present a program for Princeton University. Men of science should, therefore, read Professor Wilson's words in order that they may know of the existence of a point of view which they may have thought obsolete.

Professor Wilson holds that the scientific spirit of the age is 'doing us a great disservice, working in us a certain great degeneracy,' that the limitations of science are known to its own masters, who 'have eschewed sense and confined themselves to sensation.' He is indeed prepared to acknowledge certain achievements of science, but for him 'the scientist' seems to be the man who invents the steam engine or the sewing machine. The practical applications of physical science have, it is true, reformed the world. They have answered with facts Professor Wilson's predecessor whose *a priori* arguments claimed that population must increase more rapidly than the means of subsistence. They have made possible a civilization in which each man may have not only physical well-being, but also time and means for thought and culture. But I believe that science has done more than this; it has not only given opportunity for education and culture; it also offers the best means of culture and the truest standpoint from which to view the world. Keats might see no beauty in the rainbow after its causes had been explained to him, and Professor Wilson may think Phœbus and his horses a nobler conception than those of modern astronomy. But the man of science does not find that the beauty of the world becomes less, as he learns more of its order.

Scepticism, pessimism and the like are much older than the present century; they do not result from scientific study, as Professor Wilson claims, but are rather literary products. It is not the student of science, but Professor Wilson, who 'cowers' 'in an age of change.' If, as Professor Wilson says, classical studies make a boy a gentleman, scientific studies may make him a man. The present writer does not undervalue classical studies, but finds the difficulty to be that in a college such as Princeton the work with grammar and dictionary is a somewhat trivial science and the student does not go on far enough to appreciate classical literature and art or to undertake the scientific study of the causes of the

development of civilization. But Professor Wilson holds that science should confine itself to counting the chemical elements and becomes a 'noxious, intoxicating gas' when its methods are applied to the study of the development of society.

Views such as Professor Wilson offers on the limitations and evil effects of science seem like a survival from the denominational college of fifty years ago, and I regard it as unfortunate that they should have been presented in an official address at the inauguration of Princeton University.

J. McKEEN CATTELL.

SCIENTIFIC LITERATURE.

Monograph of the Bombycine Moths of America, North of Mexico, including their Transformations and Origin of the Larval Markings and Armature. Part I., Family 1, the Notodontidæ. By ALPHEUS S. PACKARD. Nat. Acad. of Sci., Vol. VII., First Memoir. 1895. Pp. 291, 4to, plates 49, many colored, and 10 maps.

"I am greatly pleased," writes Dr. A. Spuler, of Erlangen, "when I note how much, in these latter days, the study of entomology in America is pursued by true zoologists, and not by mere dilettants." Dr. Spuler and other exponents of scientific entomology will be convinced in this belief if American entomology maintains the standard set for it by Dr. Packard's latest important work, the first part of his monograph of the Bombycine moths of North America.

It is with the chapters of the book included in its first eighty pages that my brief criticism will chiefly have to do. These introductory chapters present a discussion of the present knowledge of the phylogeny of the Lepidoptera, a knowledge to which Dr. Packard has been a conspicuous contributor, and with the details of which he is thoroughly conversant.

Since there have been students of insects there has been classification of insects. There have been pre-Darwinian and post-Darwinian classifications. But not until very recent years has there been much of a revealed phylogeny of insects. However fully and unreservedly we have, for years now, accepted the theory of descent, we have been, speaking for the while only of entomologists, very slow to align our work with our beliefs. We have been content

with Linnæan classifications. We have been inconsistent. We have let phylogeny and ontogeny mean to us—if, haply, they had any meaning for us—problems for the 'general zoologists,' the German morphologists and embryologists. But if we are Darwinians our systematic entomology must take on the aspect of phyletic study, and drop its too long persistent Linnæan character.

Of late, fortunately, there has appeared an awakening among American entomologists, and some notable progress has been made toward an appreciative recognition of the demands made upon us by our beliefs. This welcome beginning of the phylogenetic study of insects is specially noticeable in the treatment of the Lepidoptera. The recent studies of Comstock and Dyar, of Chapman (England) and of Spuler and Walter (Germany), combined with his own, have enabled Dr. Packard to present in the preliminary chapters of this monograph a suggestive and reasonable discussion of the phylogeny of the moths and butterflies. It would be ill advised to attempt to refer here to the details of this discussion; many of these details are yet moot points, most of them, indeed. There is yet no consensus of authority to refer to on these questions. There are not enough men competently familiar with the matters at issue to form a consensus of authority, if one may so put it. It is a bold undertaking, perhaps, to attempt, as yet, to arrange phyletically the species of a family of insects; but it is a praiseworthy undertaking, because it is consistency. Dr. Packard is a Neo-Lamarckian. He believes that he finds much evidence for Neo-Lamarckism in the adaptational characters of the larvæ and pupæ. A Neo-Darwinian might affirm that the author has assumed the truth of Neo-Lamarckism and has explained the origin and development of these characters in accordance with his belief. There is an unsatisfying character about the treatment of the interpolated adaptive characters of the immature stages. The categorical distinguishing between the adaptational and the congenital characters seems arbitrary. But any questioning of the interpretations or dissent from the conclusions contained in these chapters on the phylogeny of the Lepidoptera cannot lessen